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PINE BUTTERFLY[1/], BOISE AND PAYETTE NATIONAL FORESTS IDAHO, 1981

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ABSTRACT

The pine butterfly can be a serious defoliator of ponderosa pine. In August 1981, flights of adult butterflies occurred in a widespread area on the Boise National Forest. Population status was assessed, and 1982 defoliation predictions were made. Defoliation next year will be localized. Intensity will range from negligible to moderate on the Boise National Forest and negligible on the Payette National Forest.

INTRODUCTION

Historically, pine butterfly, *Neophasia menapia* (Felder and Felder), infestations in the Boise and Payette River watersheds date back to the late 1890s and have since recurred in the periods, 1920 to 1924 and 1950 to 1954 (Hopkins 1907, Cole 1966).

The pine butterfly has one generation per year. The conspicuous white adult butterflies are active around the middle of August and may extend into early October. The adults mate and deposit green eggs in rows on the current year's needles of ponderosa pine. Winter is passed in the egg stage. Eggs hatch with the expansion of the new foliage in the spring, and the young larvae feed gregariously, ordinarily on older needles. This causes the twigs to be defoliated with the exception of the current year's foliage. Trees then appear thin and only "tufts" of new needles remain. This defoliation may result in tree mortality and/or predisposition to bark beetle attacks. Mature larvae pupate on the host trees or surrounding vegetation. After approximately 10 to 15 days, adult butterflies emerge, thus completing the cycle.

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In August 1981, flights of adult butterflies occurred in widespread areas throughout the ponderosa pine type on the Boise National Forest and adjacent State and private lands. Adults were especially noticeable along the North Fork of the Payette River north of Banks, Idaho. A single area of 500 to 600 acres was lightly to moderately defoliated south of Dry Buck Summit on the Emmett Ranger District. Aerial surveys conducted prior to August revealed no defoliation. In September and October 1981, I evaluated the current situation to estimate the extent of the infestation and determine its status in relation to expected defoliation in 1982.

METHODS

Techniques from earlier investigations (Bousfield and Dewey 1972) were used to predict 1982 defoliation. A sample unit of foliage consisted of the apical 5 inches of a branch. Six of these apical twigs were cut with a pole pruner from around the mid-crown of each of ten trees in every sample location. Additionally, twenty trees at each sample location were assessed for current defoliation. Evaluation sites were chosen from both previous assessment sites (Valcarce 1972, 1973) and areas of reported butterfly activity (Figure 1). Samples were collected from 15 evaluation sites located on the Payette and Boise National Forests.

In the laboratory, eggs were counted. Egg counts were categorized as viable or destroyed by predation. Viable egg counts and levels of current defoliation were then used in the following equation developed by Bousfield and Dewey (1972) to predict defoliation:

$$Y = -0.0659 + 0.0141 (X_1) + 0.02 (X_2), \text{ where}$$

Y = predicted defoliation index

X_1 = mean number of viable eggs per 5-inch branch

X_2 = percentage of trees with current visible defoliation

Defoliation indices (Y) were then converted to predicted 1982 percent defoliation by interpolation using the following (Bousfield and Dewey 1972):

Predicted Defoliation Index	Predicted Defoliation %	Category
0	0	Negligible
1	25	Light
2	50	Moderate
3	75	Heavy
4	100	Severe

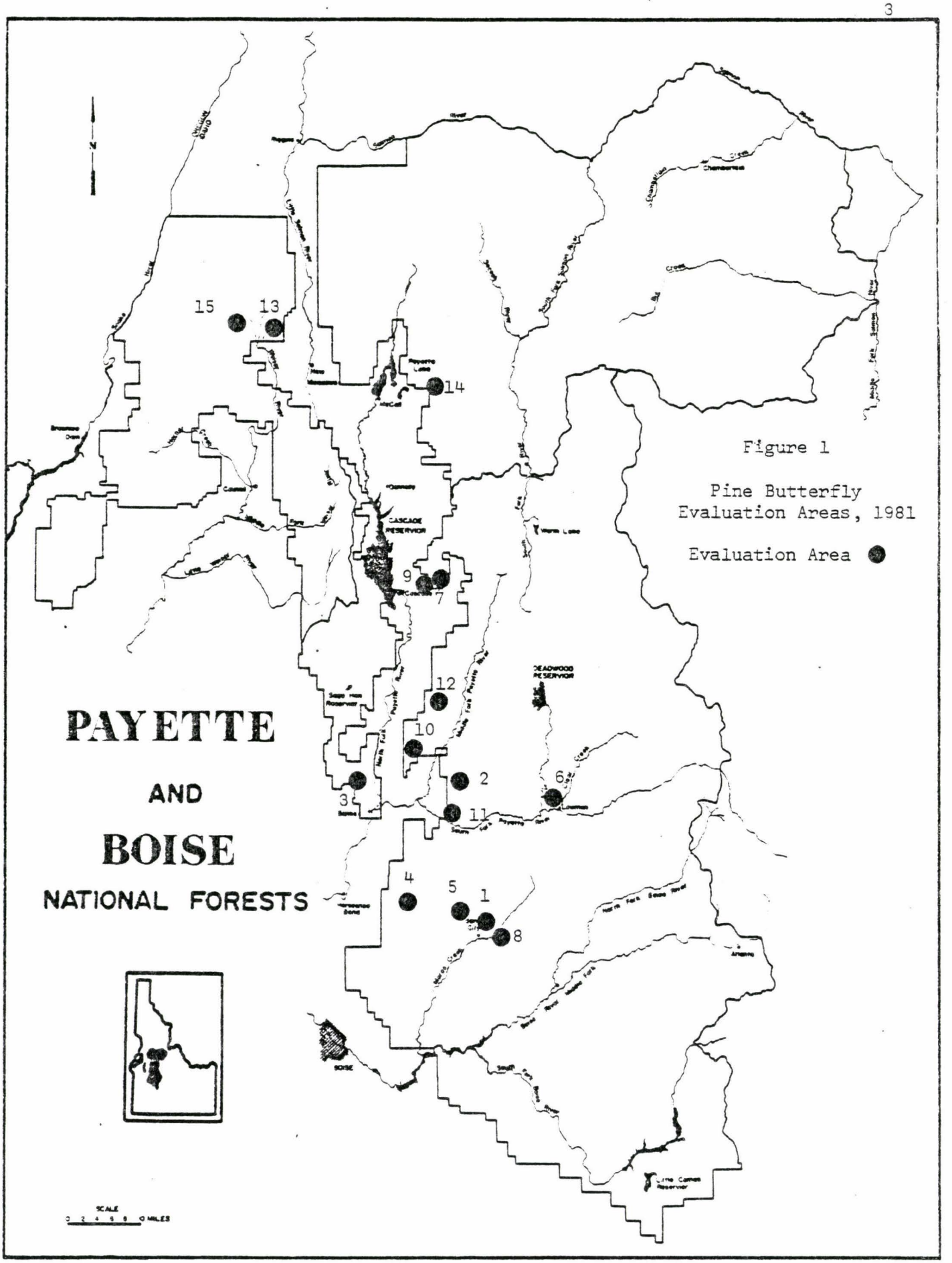

Figure 1

Pine Butterfly
Evaluation Areas, 1981

Evaluation Area ●

RESULTS

Viable eggs were found on foliage collected from nine areas, all located on the Boise National Forest (Table 1). Predicted levels of defoliation range from negligible to moderate. Based on both egg counts and defoliation sustained in 1981, moderate defoliation is expected on the Emmett Ranger District near Dry Buck Summit, in the Cow Creek drainage, and on the Idaho City Ranger District in the North Fork of Rabbit Creek drainage. Although moderate defoliation is expected, feeding may be much more noticeable next year because larvae will be forced to concentrate their activity on fewer needles.

Defoliation will be negligible in the remainder of the areas sampled (Table 1). At six sample sites--Bear Run, Henry's Creek, West Fork of Sixmile Creek, Boulder Creek, Brown's Pond, and Railroad Saddle--no eggs were found. These same areas, with the exception of Brown's Pond, had sustained no defoliation. The remainder of the sample areas--Harris Creek Summit, Lick Creek, Little Pearsol Creek, Pearsol Creek, Scriver Creek, and Station Creek--had both low egg counts and little or no 1981 defoliation. These two factors, viable egg counts and 1981 defoliation, when combined in the predictive equation, yielded negligible defoliation categories for 1982.

Lab analysis produced evidence of egg predation on six of the nine areas where pine butterfly eggs were found. Predation ranged from 0 to 27 percent with an average of 9 percent (Table 2). Dry Buck Summit, Little Pearsol Creek, and Station Creek all sustained a higher than average level of predation. At Little Pearsol Creek and Station Creek the significantly higher levels of predation contribute to the negligible defoliation predictions. The predation levels at Dry Buck Summit, Pearsol Creek, Cow Creek, and Scriver Creek are insignificant.

Table 1. Potential Defoliation by the Pine Butterfly on the Boise and Payette National Forests in 1982

Map Locator Number	Area	Mean No. Viable Eggs/5-in. Twig	Trees Showing Defoliation (%)	Predicted Defoliation Index	Predicted Defoliation in 1982 (%)	Category
	Boise NF					
1	Bear Run	0	0	0	0	Negligible
2	Cow Cr.	0.37	100	1.9	47	Moderate
3	Dry Buck Summit	33.67	100	2.4	60	Moderate
4	Harris Cr. Summit	0.27	20	0.3	7	Negligible
5	Henry's Cr.	0	0	0	0	Negligible
6	Lick Cr.	0.10	5	0	0	Negligible
7	Little Pearsol Cr.	0.40	0	0	0	Negligible
8	N. Fk. Rabbit Cr.	0.13	85	1.6	40	Moderate
9	Pearsol Cr.	2.35	20	0.4	10	Negligible
10	Scriver Cr.	0.28	10	0.1	2	Negligible
11	Station Cr.	0.20	0	0	0	Negligible
12	W. Fk. Sixmile Cr.	0	0	0	0	Negligible
	Payette NF					
13	Boulder Cr.	0	0	0	0	Negligible
14	Brown's Pond	0	10	0.1	2	Negligible
15	Railroad Saddle	0	0	0	0	Negligible

Table 2. Pine Butterfly Egg Predation on the Boise National Forest, 1981

Area	Mean Number of Eggs/5-Inch Twig		Percent Predation
	Total Eggs	Destroyed by Predation	
Dry Buck Summit	39.50	5.83	14.8
Pearsol Cr.	2.55	0.20	7.8
Little Pearsol Cr.	0.55	0.15	27.3
Cow Cr.	0.38	0.02	4.4
Scriver Cr.	0.30	0.02	5.6
Harris Cr. Summit	0.27	0	0
Station Cr.	0.25	0.05	20.0
N. Fk. Rabbit Cr.	0.13	0	0
Lick Cr.	0.10	0	0

DISCUSSION

The history of previous outbreaks (Cole 1956) indicates that pine butterfly has severely defoliated stands on a 20- to 30-year cycle. The last major outbreak occurred from 1950 through 1953. Given the current situation and recalling the historic cycles, I expect the localized populations to expand and intensify in the future. This is especially true around Dry Buck Summit and the Cow Creek and North Fork of Rabbit Creek drainages. Defoliation in these areas next year will be moderate. In those sample areas where eggs were found but where there was little or no accompanying defoliation, evident defoliation will probably not occur for 2 to 3 years.

Hopkins (1907) stated that natural enemies prevent long-term defoliation by pine butterfly. Valcarce (1972) also stated that natural enemies control infestations in 2 to 5 years. At Little Pearsol Creek and Station Creek this predator/parasite complex appears to be established. At Dry Buck Summit, Pearsol Creek, Cow Creek, and Scriver Creek predators and parasites are exerting little controlling pressure on the pine butterfly population.

MANAGEMENT ALTERNATIVES AND RECOMMENDATIONS

Maintain Present Management - Under this approach the infestation would be allowed to run its course. Past outbreaks have lasted from 2 to 5 years. If this infestation develops as past outbreaks, both tree mortality and reduced growth potential will occur (Evenden 1940). In the 1920s, 26 percent of the defoliated trees were killed, and in the 1950s only 1.3 percent of the defoliated trees were killed; however, this latter infestation was successfully suppressed using DDT (Cole 1966). Both in the 1920s and 1950s estimated normal growth increment was reduced by at least 39 percent (Evenden 1940, Cole 1966).

Silvicultural Management - This alternative creates stand conditions which disfavor the insect. Evenden (1940) found no correlation between crown classes or diameters and the resultant mortality; but tree vigor, prior to defoliation, was important in a tree's recovery from defoliation. Since little is known about stand conditions in relation to pine butterfly populations, the following conditions are only conjectures. Prescriptions which 1) favor stand species diversity and 2) maintain vigorous growth in stands should be effective. This long-term action would do very little to affect the current population.

Direct Suppression - *Bacillus thuringiensis* Berliner, a bacterium, is the only insecticide registered by the Environmental Protection Agency for use in suppression of pine butterfly. Environmentally, this insecticide is very safe since it kills only lepidopterous insects; however, it has yielded inconsistent results in suppressing outbreaks of other forest defoliators.

Recommendation - The "maintain present management" alternative is currently most reasonable. An increased state of awareness is also recommended. Since an outbreak is possible, known areas of defoliation should be monitored so that opportunities for management be recognized. Additionally, detection efforts should be increased to recognize new areas of defoliation.

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